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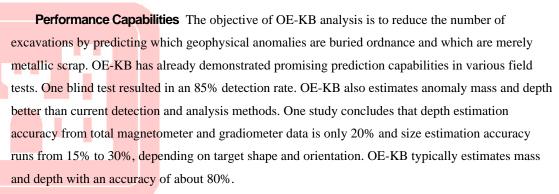
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OE knowledge base

A system that learns through experience

OE-KB is a computer software tool that selects, processes, and analyzes disparate data gathered from various ordnance sites in order to help investigators find ordnance more easily—maybe even pinpoint it. The ultimate goal is to determine a signature, or fingerprint, that would positively identify each type of buried munition.



Methodology OE-KB analysis is unique because the system actually learns through "experience," continuously improving its predictive capabilities. Knowledge Base gains experience through its neural network, an analytical tool based on the way neurons in the human brain receive, process, store, and communicate knowledge. Used to solve problems that typically defy formula-based analytical methods, neural networks produce answers based entirely on empirical evidence, or in human terms, through experience.

Synthesizing Data Because maximum values are only one piece of the puzzle, analyses based on such values alone can yield incorrect results. By "learning" the importance of all the instrument readings surrounding an anomaly rather than relying on only the maximum reading, OE-KB can synthesize many variables influencing the geophysical signals of underground objects. Such variables include soil conditions, other nearby objects, object deterioration, material composition, object orientation, instrument-object spatial configuration, and instrument operational conditions.

US Army Corps of Engineers Engineering and Support Center, Huntsville For example, the tables below show data collected with a dual-coil pulsed induction sensor (Geonics EM-61). The peak (or maximum) values in table 1 tell us that the EM-61 (a pulsed induction sensor) sees three anomalies as very different when they actually have similar mass and depth. Conversely, the peak values in table 2 tell us that the EM-61 sees the three anomalies as very similar when they actually have vastly different depth and mass. Knowledge Base solves the problem of peak values by also analyzing other values and "remembering" and comparing all value relationships associated with a target of a particular mass and depth.

Table 1			
Anomaly ID	Weight (lb)	Depth (in)	Coil 2 Peak (mV)
1	10	6	117
2	10	6	76
3	10	6	37
Table 2			
Anomaly ID	Weight (lb)	Depth (in)	Coil 2 Peak (mV)
4	5.0	6	24.1
5	0.3	2	24.3
6	12.0	12	24.6

Because KB's predictive capabilities depend on experience, the broader the data base, the better OE-KB's analysis. To build a comprehensive data base, Huntsville Center uses its OE-GIS, which holds and manages data from various site investigations, including historical maps, detection instrument readings, and archives search reports. OE-KB taps GIS data, selecting the data it needs for analysis. As the data base grows with information from more site investigations, OE-KB gets "smarter," predicting anomaly locations more and more accurately.